

REMARKS

Administrative Overview

Claims 1-56 were presented in the original application, which was filed on December 14, 2001. The Office action, dated December 17, 2004, rejects claims 1-9, 12-21, 24-36, 39-48, and 53-56 under 35 U.S.C. § 102(e) and rejects claims 10, 11, 22, 23, 37, 38, and 49-52 under 35 U.S.C. § 103(a).

More specifically, the pending Office action rejects claims 1-9, 12-21, 24-36, 39-48, and 53-56 under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,552,722 to Shih et al. (Shih), and rejects claims 10, 11, 22, 23, 37, 38, and 49-52 under 35 U.S.C. § 103(a) as being unpatentable over Shih in view of U.S. Patent No. 6,191,796 to Tarr (Tarr).

Applicants amend claims 1-4, 9, 10, 12, 18-21, 23, 28-31, 36, 37, 39, 45-48, and 52 as shown in the preceding Listing of Claims, and cancel without prejudice claims 13, and 40. Applicants add claims 57 and 58. Support for the amendments may be found throughout the specification and drawings, and at least on page 2 at paragraph 5, page 3 at paragraph 9, page 5 at paragraph 25, page 9 at paragraph 53, and in Figure 8.

Applicants submit that no new matter has been added by any of these amendments. Following entry of the present Amendment, claims 1-12, 14-39, and 41-58 are pending in this application.

Independent Claim 1 is Patentable Over the Cited Art

Claim 1 stands rejected under 35 U.S.C. § 102(e) as being anticipated by Shih. For a claim to be anticipated under 35 U.S.C. § 102(e), a single prior art reference must teach each and every limitation in the claim. Applicants respectfully traverse this rejection because Shih fails to teach every element of amended claim 1.

Applicants amend original claim 1, as reflected in the preceding Listing of Claims. The method of amended claim 1 comprises converting a subset of a volumetric model into a non-volumetric representation, and modifying the non-volumetric representation according to a stimulus.

Shih does not teach directly modifying a *non-volumetric* representation of a virtual object as recited in amended claim 1. Rather, Shih teaches modifying a *volumetric* representation of a virtual object.

An example of a non-volumetric representation is a surface-based representation. A virtual object in Shih has a surface-based representation, but Shih teaches converting the surface-based representation into a volumetric representation (i.e. a voxel-based representation), then *modifying the volumetric representation*. For example, Shih teaches at column 2 line 66, "the

method includes importing an imported surface . . . , converting it to a volumetric object, and *modifying the volumetric object.*" [emphasis added].

Modifying the volumetric representation does not provide optimal results in certain applications. Paragraph [0003] of the present invention states the following:

In volumetric models, it is difficult if not impossible to make changes such as bending, stretching, and other gross modifications without loss of significant model details. Conversely, although surface-based methods more adequately support stretching, tugging, and other 'rubber sheet' like operations, they lack the editing capabilities which volumetric representations provide, such as voxel-value-averaging and automated handling of self-intersections and overlaps.

The invention of claim 1 provides an advantage over Shih in that it allows gross modifications of a virtual object, such as bending and stretching, without significant loss of surface details, while still maintaining a volumetric representation of the virtual object. As described in paragraph [0061], methods of the invention allow more flexible interactive editing of volumetric models by supporting a wider range of operations, without compromising the strengths of a volumetric representation.

For example, an embodiment of the invention, as described in Figures 2A and 2B, allows stretching of a surface without smoothing away details present on that surface. This provides the ability to make relatively large, global changes to models even at a stage of model development where high resolution features have been applied to the surface of the model. For example, the invention permits a model of a head to be modified by puffing out the cheeks without losing facial details, or in a model of an automobile, to add bulge to wheel wells without distorting the remainder of the vehicle. This is accomplished, for example, by converting a subset of a volumetric model to a non-volumetric representation, modifying the non-volumetric representation, and re-rasterizing to instantiate the changes in the volumetric model representation.

Therefore, because Shih fails to teach or suggest every element of amended claim 1, Applicants respectfully request that the rejection of claim 1 based on 35 U.S.C. § 102(e) be reconsidered and withdrawn.

Independent Claims 25, 27, 28, 54, and 56 are Each Patentable Over the Cited Art

Claims 25, 27, 28, 54, and 56 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Shih. Applicants respectfully traverse these rejections because Shih fails to teach every element of amended claim 1.

Claims 25, 27, 28, 54, and 56 disclose methods and systems that include modifying a *non-volumetric* representation of a virtual object. As discussed above with respect to claim 1, Shih does not teach or suggest the step of modifying a non-volumetric representation of a virtual object. Rather, Shih teaches modifying a volumetric representation of a virtual object.

Because Shih fails to teach or suggest every element of claims 25, 27, 28, 54, and 56, Applicants respectfully request that the rejection of these claims under 35 U.S.C. § 102(e) be reconsidered and withdrawn.

Dependent Claims 10, 11, 22, 23, 37, 38, and 49-52 Are Each Patentable Over the Cited Art

Dependent claims 10, 11, 22, 23, 37, 38, and 49-52 stand rejected under 35 U.S.C. § 103(a) as being obvious over Shih in view of Tarr. Applicants respectfully traverse these rejections.

In order to establish a *prima facie* case of obviousness, there must be some suggestion or motivation, either in the references themselves, or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine the reference teachings (MPEP § 2143). Applicants respectfully submit that there is no suggestion or motivation, either cited in the references or in knowledge generally available in the art at the time of filing, to modify the invention of Shih to incorporate elements of the invention of Tarr.

The Office action at page 6, paragraph 6, cites Tarr (col. 2, lines 1-8) as providing motivation to combine references, as follows:

It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the triangular representation as taught by Tarr into the sculpting virtual object in a haptic virtual reality environment of Shih's system for modifying the virtual object, because it would provide a method for haptically deforming a virtual surface within a haptic virtual environment which would be represented by a mesh of polygons such as triangles (col. 2, lines 1-8).

There is no suggestion in Tarr to combine its teachings with those of Shih to produce the invention of dependent claims 10, 11, 22, 23, 37, 38, and 49-52 because Tarr does not suggest *creating a volumetric representation* of a virtual object whose non-volumetric (i.e. surface-based) representation is modified by methods described therein. Likewise, Shih does not suggest *modifying a non-volumetric representation* of a virtual object to affect a change in a volumetric model of the object.

Because the motivation or suggestion to combine the cited references is not provided within the references themselves, nor in knowledge generally available in the art, Applicants

respectfully request that rejection of dependent claims 10, 11, 22, 23, 37, 38 and 49-52 under 35 U.S.C. § 103(a) be reconsidered and withdrawn.

Furthermore, because dependent claims 10, 11, 22, 23, 37, 38 and 49-52 depend directly or indirectly from independent claims 1 or 28, each of the dependent claims includes all the limitations of its respective independent claim. As discussed above, independent claims 1 and 28 are both patentable over the cited art. Therefore, dependent claims 10, 11, 22, 23, 37, 38 and 49-52 are patentable over the cited art for this reason as well, and Applicants respectfully request that rejection of dependent claims 10, 11, 22, 23, 37, 38 and 49-52 under 35 U.S.C. § 103(a) be reconsidered and withdrawn.

Dependent Claims 2-9, 12, 14-21, and 24 are Each Patentable Over the Cited Art

Claims 2-9, 12, 14-21, and 24 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Shih. Applicants respectfully traverse these rejections.

Applicants amend dependent claims 2, 4, 9, 10, 12, and 18-21 as shown in the preceding Listing of Claims to reflect the amendment of claim 1. Because amended claims 2, 4, 9, 10, 12, 18-21, and original claims 3, 5-8, 14-17, and 24 each depend from amended claim 1, they each include all the limitations of amended claim 1. As discussed above, Shih fails to teach, or even suggest, every element of amended claim 1.

Therefore, because Shih fails to teach or suggest every element of dependent claims 2-9, 12, 14-21, and 24, Applicants respectfully request that the rejection of these claims under 35 U.S.C. § 102(e) be reconsidered and withdrawn.

Dependent Claims 29-36, 39, 41-48, and 53 are Each Patentable Over the Cited Art

Claims 29-36, 39, 41-48, and 53 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Shih. Applicants respectfully traverse these rejections.

Applicants amend dependent claims 29, 30, 31, 36, 39, and 45-48 as shown in the preceding Listing of Claims. Because amended claims 29, 31, 39, and 45-48 and original claims 32-35, 41-44, and 53 each depend from amended claim 28, they each include all the limitations of amended claim 28. As discussed above, Shih fails to teach, or even suggest, every element of amended claim 28.

Therefore, because Shih fails to teach or suggest every element of dependent claims 29-36, 39, 41-48, and 53, Applicants respectfully request that the rejection of these claims under 35 U.S.C. § 102(e) be reconsidered and withdrawn.

Appl. No. 10/017,148
Response dated May 17, 2004
Reply to Office action of December 17, 2003

Dependent Claims 26 and 55 Are Each Patentable Over the Cited Art

Original dependent claims 26 and 55 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Shih. Applicants respectfully traverse these rejections.

Because claims 26 and 55 depend directly from amended claims 25 and 54, respectively, they include all the limitations of claims 25 and 54, respectively. As discussed above, Shih fails to teach, or even suggest, every element of claims 25 and 54.

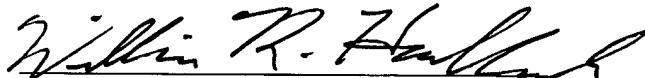
Therefore, because Shih fails to teach or suggest every element of dependent claims 26 and 55, Applicants respectfully request that the rejection of these claims under 35 U.S.C. § 102(e) be reconsidered and withdrawn.

Conclusion

Applicants request that the Examiner reconsider the Application and claims in the light of the foregoing Amendment and Response. Applicants respectfully submit that in view of the amendments and remarks herein, claims 1-12, 14-39, and 41-58 are in condition for allowance. Applicants, therefore, respectfully request issuance of a Notice of Allowance in due course.

If the Examiner believes that it would be helpful to discuss any aspect of the application by telephone, the undersigned representative cordially invites the Examiner to call at the telephone number given below.

Respectfully submitted,



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